Chapter One:

Study Background and Description of Passive Alcohol Sensors

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Description of Passive Alcohol Sensors

Passive Alcohol Sensors are hand-held analytical devices used by law enforcement and other authorities to detect the presence of alcohol in the breath and air. For purposes of this study, the following definition will be used:

Passive Alcohol Sensor (PAS) – Defined

"Analytical device for the *qualitative* measure (presence or absence of alcohol, but not a specific quantity) of:

1) Breath-containing air surrounding a person or persons, e.g. the passenger compartment of a car **– OR –**

2) Ambient air about a micro-environment, e.g. the airspace immediately above a suspected alcoholic beverage."

Passive alcohol sensors are sometimes known colloquially as "sniffers" and are manufactured in various shapes. Unlike an evidential breath test device such as the Intoximeter EC/IR, a passive alcohol sensor cannot be used to measure how much alcohol is on a person's breath.

According to Voas[1], Honda Motor Company developed the original passive alcohol sensor in Japan. Although the actual date of origination was not found, the first studies appear to be in 1983. The original passive alcohol sensor was a baton-shaped flashlight that was twenty inches long and made of plastic. It weighed four pounds with batteries. Because it was sensitive to other chemical compounds found in the air, as well as expired air, it was not considered to be very useful.

Passive alcohol sensors come in many shapes and sizes. Though all passive alcohol sensors will share many basic features of the technology as described above, once marketed, passive alcohol sensors come in many shapes and sizes. Please see Appendix B that provides examples of different types of passive alcohol sensor devices. Several passive alcohol sensors resemble preliminary breath test devices (PBT). Most are gray or black in color, but two are a very visible yellow.

Some devices are not readily identifiable by the driver as an alcohol-detecting device. A model typically used by Wisconsin law enforcement agencies is the flashlight or

[1] Voas, RB. "Laboratory and Filed Tests of a Passive Alcohol Sensing System." Abstracts and Reviews in Alcohol and Driving 4(3):3-21 (1983).

baton-shaped passive alcohol sensor.[2] Other forms include clipboard-like devices and shapes that resemble small electronic devices.

Passive alcohol sensors share common characteristics, with portability being a universal feature. The units are designed to be hand held, weighing from ten to thirty two ounces and measuring from five to fourteen inches long, and are powered by batteries, either disposable or rechargeable. Most manufacturers recommend a 15-minute deprivation period (subject abstains from drinking or eating) prior to administering a test, but no mouthpieces are required for passive testing.

How a passive alcohol sensor operates. The general operation of a passive alcohol sensor consists of pointing or directing the sampling port of the device at a subject's mouth from a distance indicated by the manufacturer. Depending on the device, the operator instructs or encourages the subject to breathe, blow or speak at the device as the device takes an air sample. In a matter of seconds, the fuel cell analyzes the sample, providing a result in the form of either a numerical readout, lights indicating zero/low/high presence of alcohol, or a "P" (pass) or "F" (fail) indicating the absence or presence of alcohol.

Passive alcohol sensors operate at a range of ambient temperatures from a low of 0 - 32 degrees to a high of 104 - 105 degrees Fahrenheit. The sampling mechanism is most commonly a pump, or it can be a fan. Test results are obtained within seconds. Devices are ready for a subsequent test from two to thirty seconds after a negative air sample and from twenty seconds to two minutes after an alcohol-laden air sample is tested.

Calibration is generally required at least once a year, and according to the manufacturers, can be done by the user in most cases. Accuracy checks are recommended more frequently. The standard warranty is one year, parts and labor. See Appendix B for pictures of passive alcohol sensors and Appendix A for a chart of individual features.

Comparison to Other Breath Testing Technology. Passive alcohol sensors, preliminary breath tests, and evidentiary breath tests (EBT) (e.g. the Intoximeter EC/IR) all utilize fuel cell technology to detect alcohol. A fuel cell is a porous disk containing a solution that oxidizes ethanol into carbon dioxide and water, while releasing electrons. The electrons are present in proportion to the amount of ethanol present, allowing the fuel cell to perform as a linear sensing device.

The primary technical difference among passive alcohol sensors, PBTs, and EBTs lies in the manner in which a sample is taken for analysis. Passive alcohol sensors utilize either a pump or a fan to draw a sample of breath containing ambient air into the device for analysis. This relatively imprecise sampling mechanism allows only a

[2] The PAS devices resembling flashlights (i.e. PAS III) have been used by law enforcement in the following municipalities/counties: Dane County, Elkhart Lake, City of Green Bay, City of Manitowoc, City of Waukesha, Village of Whitefish Bay.

qualitative determination of alcohol present in a sample. In other words, passive alcohol sensors can only determine the absence or presence of ethanol in the air that was sampled. The source of the ethanol cannot be known with certainty.

PBTs improve on the sampling quality by requiring the cooperation of a willing subject to provide a sample. The PBT operator instructs the person to provide a deep lung or alveolar air sample for analysis by the PBT.

PBT sampling accuracy can be limited by cold ambient temperatures, and by an operator's judgment as to when the deep lung air has been sampled. Properly administered, a PBT eliminates the uncertainty as to ethanol source and can provide an excellent correlation to a person's true blood or breath alcohol concentration. Evidentiary breath tests completely solve the sampling problems inherent in the other devices. In Wisconsin, EBTs are placed in climate-controlled rooms and utilize electronic measures to determine when alveolar air has been produced from the subject and consequently, when a sample of their breath should be taken for analysis. EBTs are commonly used in research and forensic settings because of their excellent accuracy and reliability.

Regulation of Breath Testing Devices. The other major difference among these devices lies in how breath-testing devices are regulated under 343.306 and the related administrative code Chapter Trans 311. Although Wisconsin State Statutes do not specifically prohibit the use of passive alcohol sensors for traffic enforcement in Wisconsin, the Division of State Patrol, Chemical Test Section does not recommend the use of passive alcohol sensors for traffic enforcement. Therefore, passive alcohol sensors that are used in WI are not supported by the Chemical Test Section meaning any evaluation, calibration, accuracy checks, maintenance, repair, operator training or certification is the responsibility of the agency choosing to use a passive alcohol sensor for purposes of traffic enforcement.

Finally, passive alcohol sensors, PBTs and EBTs are significantly different in how much operator judgment can influence the results of the test. The Intoximeter EC/IR is microprocessor controlled. If any element of the device is functioning improperly, a test result will not be reported. Conversely, erroneous passive alcohol sensors results can be obtained in a number of ways, from not ensuring the fuel cell has been cleared of a previous alcohol laden sample before sampling another subject, to attributing a positive test from an environmental source to a subject's breath. The PBT lies somewhere in the middle in terms of operator control. For example, some PBTs require an operator to judge when alveolar air has been produced from a subject prior to taking a sample for analysis. The more latitude an operator has in obtaining a result, the more exposed the officer is to scrutiny and criticism of their technique.

Purchase and Maintenance Costs

Unit Costs

Passive alcohol sensor prices per unit range from approximately $300 to $700. See Appendix A for 2002 prices. Manufacturers may allow for a more favorable per unit cost if multiple units are purchased. For comparison, the Chemical Test Section provides law enforcement agencies with approved PBTs for $390 or $690 per unit, depending on the model.

Implementation Costs

Additional costs are associated with the purchase of a passive alcohol sensor. First among these is the cost of training. The Michigan Experience cited on Pages 61-63 of this document states that an 8 hour training period was required to ensure officers could operate, troubleshoot, and calibrate the passive alcohol sensor, train other officers, and were informed of associated legal issues and reporting requirements. Several of these functions are ordinarily provided by the Chemical Test Section for preliminary breath test (PBT) and evidential breath test (EBT) operators in Wisconsin. Officers receive 30- 40 minutes of training in order to permit them to use a PBT and 22.5 hours of instruction to operate an EBT, the Intoximeter EC/IR. In both cases, Wisconsin training allows an officer to simply operate a PBT or the Intoximeter EC/IR, not to perform the more complex functions that would be necessary to operate independently of the Chemical Test Section. Training costs would be an ongoing expense as employment turnover of trained officers occurs.

Passive alcohol sensors require periodic accuracy checks and calibration to maintain proper functioning. These services may be covered under warranty in the first year or can be purchased from the manufacturers. Cost estimates for these services can be obtained from the manufacturers. Alternately, law enforcement personnel can be further trained to perform these functions. For example, the Chemical Test Section trains specifically assigned law enforcement officers to calibrate their own agency's PBTs at periods not to exceed 60 days.

Replacement parts constitute an additional ongoing expense. Passive alcohol sensors may require replacement of batteries, fuel cells, light bulbs, and switches. Cost estimates for these parts can be obtained from the manufacturers.

Installation costs may be incurred to put chargers into vehicles for those devices that have rechargeable batteries. Some law enforcement officers already carry rechargeable flashlights in their vehicles, which may necessitate installation of an additional charger.

Finally, costs will be incurred by law enforcement agencies when devices approach their normal operational life span and require replacement with a newer model. Unit costs would be incurred of course, and invariably, new models have more or different

features that necessitate additional training of personnel. An example of this kind of expense is the cost incurred by the Chemical Test Section when the Intoxilyzer was phased out in 1999-2000.

Note that a more detailed discussion of passive alcohol sensors and their associated costs is included in Appendix B.

Current Use of Passive Alcohol Sensors Nationwide

Use of passive alcohol sensors in the United States. According to a review of national literature, it has been documented that passive alcohol sensors are used for multiple purposes. They are used in various capacities by law enforcement, schools and industries nationwide.

Sense Enhancement. One purpose of using passive alcohol sensors in law enforcement is to enhance the law enforcement officer's senses in the determination of a potential drunk driving violation as part of a traffic stop. Frequently, traffic officers must contend with odors in the environment (e.g., car exhaust, cigarette smoke, breath mints used by subjects in an attempt to cover up alcohol) that may interfere with their own ability to detect alcohol. A law enforcement officer's ability to distinguish between odors could become impaired if they have a cold or medical condition that diminishes their sense of smell. According to the literature, a passive alcohol sensor may help to assist an officer who is experiencing these problems.

Sobriety Checkpoints. In addition to using passive alcohol sensors for individual OWI traffic offenses, the devices have been used in some states in conjunction with motorist roadblocks or sobriety checkpoints. *Because alcohol sobriety checkpoints are prohibited by statute in Wisconsin*, passive alcohol sensors are not used as often in Wisconsin as compared to other states that utilize sobriety checkpoints.

Professional Drivers. Passive alcohol sensors have also been used to evaluate Commercial Driver License (CDL) operators, railroad engineers, airline pilots and commercial boat operators for alcohol use either during a traffic stop, as part of an accident investigation or before the professional begins her/his task.

Unconscious Individuals. Passive alcohol sensors are used to assess whether an unconscious person (e.g., at a crash scene), who is unable to give a breath sample may have been drinking.

Schools. Passive alcohol sensors have been used by law enforcement officers as an educational tool or part of presentations made to the public (such as in schools) on alcohol enforcement with the intent of deterring people from drinking and driving.

They are also used in schools to help reduce the prevalence of underage drinking and to maintain control over activities such as concerts and athletic functions by testing participants.

Industry. Usage in industry is to minimize alcohol abuse in the workplace (e.g., "zero tolerance policies") and to maximize the efficiency of employees.

Current Use of Passive Alcohol Sensors in Wisconsin

Although the Wisconsin State Patrol cannot recommend the use of any passive alcohol sensors, Wisconsin State Statutes do not specifically prohibit their use in Wisconsin. Therefore, passive alcohol sensors have been previously used for various reasons. The current uses of passive alcohol sensors were identified by Wisconsin law enforcement officers during the law enforcement focus group session conducted on September 4th, 2002 at the State Patrol District 3 Headquarters in Fond Du Lac.

To confirm a law enforcement officer's suspicions. Passive alcohol sensors are used not as the primary method to determine alcohol use, but as a tool to assist in confirming officer's suspicions. Their use does not replace the law enforcement officer's own capabilities. The devices would probably be used on an infrequent basis; the officer's own senses are usually sufficient for reasonable suspicion and probable cause.

Used as just one of many tools available to law enforcement. Arrests for OWI do not depend upon only one test. An Officer is obligated to perform the duties and necessary procedures related to an OWI traffic stop regardless of use of the device. Other necessary procedures are recognized by the courts as tools for law enforcement (e.g. Horizontal Gaze Nystagmus – HGN, standardized field sobriety test).

Cannot be used to determine whether a driver is impaired. A simple detection of alcohol does not measure impairment; further testing by field sobriety procedures and officer observations is required which includes both the law enforcement officer individual professional judgment and evidential testing (e.g., Intoximeter EC/IR).

To Deter Impaired Driving

- Used as an informational and educational/prevention tool for the public.
- Used as part of a media campaign to prevent OWI.
- Good public reminder of local traffic enforcement and OWI efforts
- Use of the devices is passed throughout a community by "word of mouth" indicating that any flashlight may be a passive alcohol sensor.
- Suggested that use of passive alcohol sensors in Milwaukee helped to reduce the number of alcohol-related crashes in the early 1990's.

To assist in crash investigations. Several of the group indicated that passive alcohol sensors can also be helpful as part of crash investigations.[3]

- Useful tool when officer is unable to use other devices (e.g. preliminary breath tester – PBT) on a crash victim due to person's injuries.

- Detection of alcohol from a "safe distance" from an injured and possibly dangerous individual (e.g. avoid bodily fluids).

To determine alcohol when other odors are present that masks the odor of alcohol. Passive alcohol sensors may be useful when other odors, such as body odors (e.g. uncleanliness, medical condition), prohibit the officer from being able to smell alcohol on the violator.

Enforcement of absolute sobriety laws.

- Determination of any alcohol use for teens/underage persons, and repeat offenders.

- Not currently authorized for use by Wisconsin State Patrol personnel when stopping commercial drivers.

[3] PAS has been used as part of crash investigations in Dane County to determine the presence of alcohol on unconscious subjects (March 8, 2002 email conversation with Sgt. Gordon Disch, Dane County Sheriff's Department).